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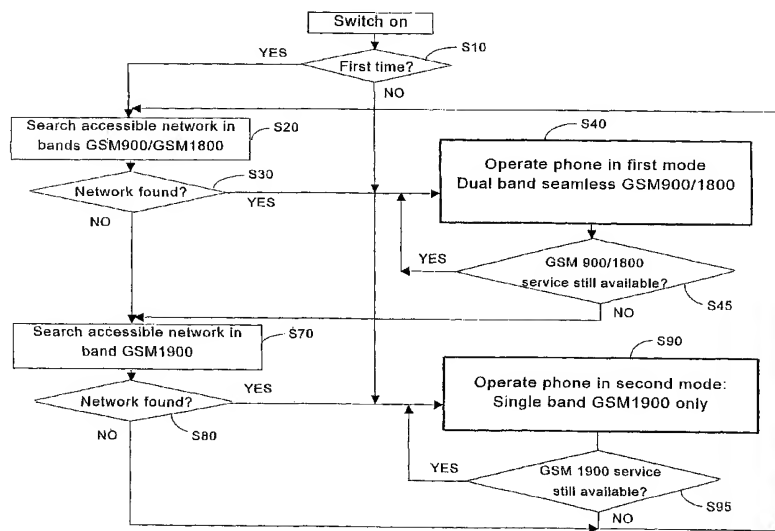
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(54) Title: METHOD FOR CONTROLLING A WIRELESS MULTI-BAND AND/OR MULTI-WAVE WIRELESS TELECOMMUNICATIONS DEVICE



(57) Abstract: The present invention relates to a method for controlling a multi-band and/or multi-mode wireless device, that is provided with an automatic operating mode selection mechanism. To speed up the search for an accessible communications network and to simultaneously reduce power consumption, the method comprises the steps of searching for a communications network by scanning that group of frequency band or operating modes first that were used during the last successful operation, and continuing the search through other possible frequency bands or modes only in the case that no accessible network was found in the group of frequency bands or modes searched first.



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METHOD FOR CONTROLLING A WIRELESS MULTI-BAND AND/OR MULTI-WAVE WIRELESS TELECOMMUNICATIONS DEVICE

Description

The present invention relates to a method for controlling a multi-band and/or multi-mode telecommunications device, in particular to a method for controlling such device that is provided with an automatic operating mode selection mechanism.

Background of the invention

A conventional triple band mobile telephone (Timeport P7389, Motorola), is provided with a manual selection mechanism for selecting a first or a second set of frequency bands of the GSM (global system for mobile communications) standard. In particular, the frequency bands according to GSM 900 and GSM 1800 or the frequency band according to GSM 1900 can be selected by the manual selection mechanism for operating this conventional mobile phone either in a dual band or a single band operating mode.

However, for selecting between operating modes that can be performed by this conventional mobile telephone, the user has to know which kind of networks he can expect in a certain geographic area or the user needs to try all possible operational modes until he finds a successful network connection. This is inconvenient, consumes time and power so that the autonomy of such a mobile telephone is reduced when it is powered by a battery.

Another multi-band/multi-mode terminal is described in US 5,999,811. In this terminal the allowed or preferred band information, i.e. information about the network that has to be primarily used is stored somewhere in the terminal, e.g. in memory portion provided on a subscriber identification module-(SIM)-card. This individual configuration is made according to the needs of the network operator to make sure that his revenue stays as wanted.

WO 95/01 070 discloses a multi network communication method for telecommunication in an environment which includes a number of different telecommunications networks, using a multi network terminal. This multi network

1 terminal itself detects those telecommunications networks to which it has ac-
cess. After detecting available communications networks the multi network
terminal itself decides in which of the accessible telecommunications net-
works communication shall take place on the basis of predetermined decision
5 criteria.

However, searching all accessible telecommunications networks prior to se-
lecting one of them needs a rather long time and reduces the stand by time of
this terminal if it is powered by a battery.

10 US 5,504,803 is concerned with a method for automatic mode selection for a
dual mode telephone handset for use in a cellular mobile telephone system
and in a wireless telephone system. The dual mode telephone handset of this
system always tries to find the private wireless telephone system first. Only
15 when know private wireless telephone system is found the handset starts to
scan the frequency band or bands of the cellular system for an accessible
network.

Summary of the invention

20 Accordingly, it is an object of the present invention to provide a method for
controlling a wireless multi-band and/or multi-mode communications device
that uses an automatic operating mode selection mechanism, that speed up
the search for an accessible communications network and simultaneously re-
duces power consumption.
25

This object is achieved by a controlling method comprising the steps of
searching for a communications network by scanning that frequency band or
operation mode first that was used during the last successful operation, and
30 continuing the search through all possible frequency bands or modes only in
case that no accessible network was found in the group of frequency bands
searched first.

According to the present invention information about that network or service
35 is stored that was successfully contacted immediately before the last inter-
ruption of the connection either due to a loss of coverage or switching off the
communications device. In the first case the communications device is con-

1 trolled for searching another accessible network first in the same frequency
band or operation modes and, if no such network will be found, the search is
continued through other possible frequency bands or modes. Similarly, in the
latter case after switching on the communications device the search for an
5 accessible network is started in the frequency band or mode of the last suc-
cessful connection to a network. This results in a reduction of time for de-
tecting an available network and therefore in a reduction of power consump-
tion since it is more probably that the user of the communications device has
made no major geographical movements since the last operation. For exam-
10 ple, if user do not leave Europe both the GSM 900 and the GSM 1800 are
available so that even if the coverage of one network was lost he/she will be
most probably in the coverage area of another network operating in accor-
dance with the same standard.

15 To improve the operation of a multi-band and/or multi-mode communications
device it is preferred that frequency bands and/or operating modes are
grouped so that each group contains those of the frequency bands and/or op-
erating modes only, that can exist in a single geographic area, wherein after
detecting an accessible network further operation is restricted to those fre-
20 quency bands and/or operating modes that belong to the same group as the
frequency band and operating mode used by the accessible network, as long
as a network is available in spite of this restriction.

This ensures that searching for a communications network will be conducted
25 through those frequency bands and/or operating modes that will be most
probably available. Only in case that no accessible network can be found the
search will be conducted through the other frequency bands and operating
modes that can be use with the communications device in question. E.g. if
the communications device was operated together with a network operating in
30 accordance with the GSM 1800 standard and no other network could be
found in the respective frequency band, the search will switch over to the fre-
quency band of the GSM 900 standard that co-exists in Europe together with
the GSM 1800 standard.

35 By grouping only those frequency bands and operating modes together that
can exist in a single geographic area it is possible to avoid checking all inter-
esting frequency bands and/or wireless standards in case that the link to the

1 actual network gets lost. Therefore, a power consumption and needed time
can be reduced or at least limited to a reasonable amount.

5 In addition, after the communications device is switched on it scans for possible networks to be connected to in that frequency band first that was successfully used during the last operation period. When an accessible network with successful service was found the device continues with only enabling those operating modes which were predefined to exist together with this first network. Other operating modes are barred as long as a service or network
10 out of the first group exist.

According to a refinement of the present invention it is preferred that after abolishing the restriction of operation in case that no accessible network can be found in the selected group, the search for an accessible communications
15 network is continued for all possible frequency bands and/or operating modes starting with a frequency band and/or operating modes that does not belong to the group of frequency bands and/or operating modes that has been selected by the restriction.

20 Accordingly, whenever the communications device loses the connection to a network completely the scanning process for searching an accessible network continues with searching networks in all possible frequency bands and/or operating modes, wherein those frequency bands and/or operating modes are searched first that were excluded by the restriction.

25

Brief description of the drawings

The invention will be explained in more detail hereinafter with reference to the accompanying drawing the only figure of which shows a simplified schematic flow chart of the inventive method.
30

Detailed description of the preferred embodiments

35 As shown in the figure a method for controlling a wireless multi-band, multi-mode communications device, in particular a triple band, double mode mobile telephone comprises the first step S10 of deciding whether or not the mobile telephone was switched on the very first time. If so in step S20 the search for

1 a network in the frequency band of the GSM 900 and GSM 1800 standards is
conducted. There after, it is decided in step S30 whether or not an accessible
network was found. In case that the search of step S20 was successful the
mobile phone will be operated in step S40 in a first mode; i.e. in a dual band
5 mode using the frequency bands of GSM 900 and GSM 1800. In this first
mode roaming and handover is performed in a way well known for dual band
mobile telephones.

In particular, during the operation of the mobile telephone in step S40 in the
10 first mode in case that the link to the actual network gets lost due to losing
coverage, i.e. when the user is leaving the coverage area of the accessed net-
work, a new network is searched first in the used frequency band an then in
the other of the group of two co-existing frequency bands according to GSM
900 and GSM 1800.

15 If the search of step S20 was not successful, the search for an accessible net-
work is continued in the next possible frequency band, i.e. in the frequency
band of GSM 1900 in step S70 thereafter it is decided in step S80 whether an
accessible network was found in step S70. If no accessible network was found
20 in step S70 the search is continued in step S20. However, if an accessible
network was found in step S70 the operation of the mobile phone is contin-
ued in step S90 using a second mode, e.g. a single band mode using only the
frequency band of GSM 1900. I.e. in case that the access to actual network
got lost, searching for another accessible network will be performed only in
25 the frequency band of GSM 1900.

Thus, in both operating modes a search through frequency bands that will be
most probably not successful is prevented by restricting the search to those
frequency bands that exists together with the frequency band of the actual
30 network. However, after conducting a search through the allowed frequency
bands it is checked in step S45 or S95 whether or not the search was suc-
cessful, if so the operating mode of the mobile phone will not be changed.

Otherwise, the restriction of the search area, i.e. the restriction to one of a
35 group of frequency bands is abolished and the search is continued through
all possible frequency bands. In a most simple case the search for a new ac-

1 cessible network will be simply continued with the first searching step, i.e.
with step S20.

5 However, since it was decided in step S45 that the frequency bands according
to GSM 900 and GSM 1800 are not available it is more likely that an accessi-
ble network will be found in the frequency band of GSM 1900. Thus, the op-
erating of the mobile phone is continued with searching an accessible net-
work in the frequency band 1900.

10 In a similar way, when a GSM 1900 network is no longer available the search
for an accessible network will be continued in the GSM 900 frequency band
in step S20.

15 Further, in case that a mobile telephone controlled according to the present
invention that has been used at least one time, it is decided in step S10 that
the operating period will not be the very first one, so that the first or the
second operating mode is selected according to the last operating mode used
during the last operation period. Thus, in this case searching for an access-
20 ible network in step S20, and S70 is skipped and an accessible network is
searched according to the operation modes of step S40 or step S90 in de-
pendence on the frequency band and operating mode that was used during
the last operation period.

25 Although the present invention as been explained in more detail in connec-
tion with GSM standards only, it is also possible to use the present invention
with a mobile telephone or another telecommunications device that can be
operated not only in different frequency bands but also with different com-
munication standards. The advantages of the present invention become more
and more evident in case that the number of possible operating modes, avail-
30 able frequency bands and standards increases, so that not only dual-mode or
triple-mode devices are used but also devices that can be used in a plurality
of operating modes. Furthermore, a device can either be a mobile telephone or
any other wireless terminal, e.g. a data terminal for fixed or mobile usage.

35

Claims

1. A method for controlling a wireless multi-band and/or multi-mode communications device, that is provided with an automatic operating mode selection mechanism, comprising the steps of

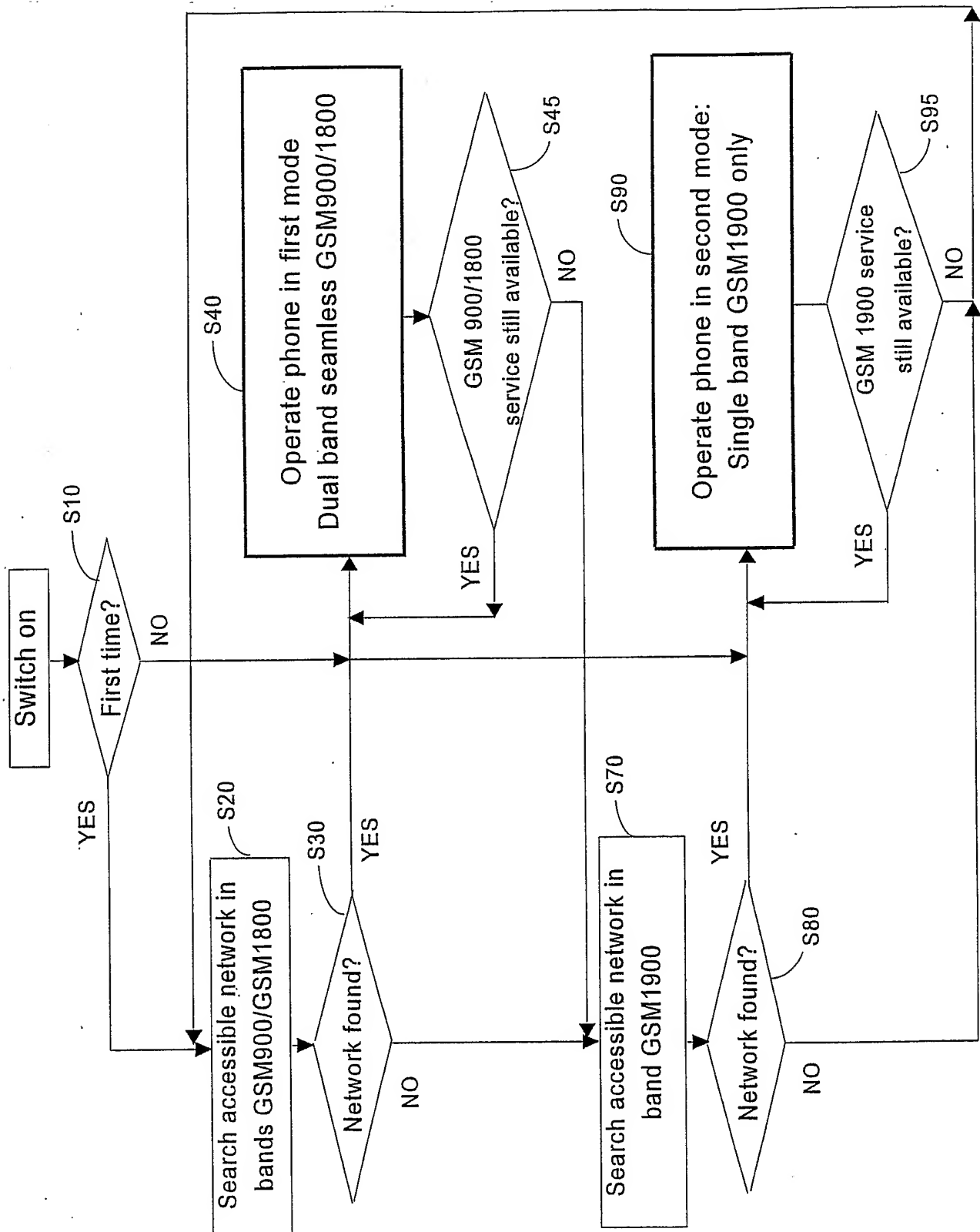
- searching for a communications network by scanning that group of frequency bands or operating modes first that were used during the last successful operation, and

- continuing the search through other possible frequency bands or modes only in the case that no accessible network was found in the frequency band searched first,

characterized in that frequency bands and/or operating modes are grouped so that each group contains those of the frequency bands and or operating modes only that can co-exist in a single geographic area.

2. The method according to claim 1, characterized in that after detecting an accessible network further operation is restricted to those frequency bands and/or operating modes that belong to the same group as the frequency band and operating mode used by the accessible network, as long as a network is available in spite of this restriction.

3. The method according to claim 2, characterized in that after abolishing the restriction of operation in case that no accessible network can be found in the selected group, the search for an accessible communications network is continued for all possible frequency bands and/or operating modes starting with a frequency band and/or operating modes that does not belong to the group of frequency bands and/or operating modes that has been selected by the restriction.



INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04Q7/32

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 504 803 A (CALLAHAN KEVIN ET AL) 2 April 1996 (1996-04-02) cited in the application column 10, line 55 -column 11, line 9 claim 1 ---	1-3
X	US 6 229 996 B1 (UISTOLA ARI) 8 May 2001 (2001-05-08) column 5, line 8 - line 64; figure 3 ---	1-3
X	US 6 223 037 B1 (PARKKILA PASI) 24 April 2001 (2001-04-24) column 5, line 59 -column 8, line 29; figure 3 -----	1-3

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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INTERNATIONAL SEARCH REPORT

information on patent family members

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